TUNGUSKA-M1

Anti-Aircraft Gun/Missile System

Mission

The Tunguska-M1 anti-aircraft gun/missile system is designed to provide air defence for ground forces in all kinds of combat operations, as well as AD cover for installations.

The Tunguska-M1 is a state-of-the-art mobile short-range air defence asset capable of defeating aircraft, helicopters (including hovering and pop-up ones) and low-altitude air targets while moving, stationed or halted for a short time. It can also engage land and surface targets.

Basic specifications	
Max target detection range (by target acquisition radar post), m	18,000
AA gun engagement envelope, km:	
altitude	0 – 3,000
range	200 – 4,000
SAM engagement envelope, m:	
altitude	15 - 3,500
range	2,500 – 10,000
Ammunition load, rounds/missiles	1,904 / 8
AA gun calibre, mm	30
Number of twin-barrel AA gun mounts	2
Cumulative rate of fire, rds/min	up to 5,000
Air target speed, m/s	up to 500
Reaction time, sec	less than 10
Max external target designation communications range, km	up to 5
Into/out-of-action time, min	not more than 5
Loaded AA SPM weight, t	not more than 35
Crew, persons	4

Composition

The Tunguska-M1 system includes combat, maintenance and training assets.

Typical set of combat assets of the system consists of:

- 2S6M1 anti-aircraft self-propelled mounts;
- 9M311-1M surface-to-air missiles in transport-launch containers, eight missiles on each SPM;
- ammunition allowance of 30mm rounds.

The maintenance assets include:

- AAGMS maintenance and repair assets and automated integrated missile test equipment;
- missile/round storage, transportation and loading means;
- group and repair SPTA sets for all elements of the system.

PANTSYR-S1

Air Defence Gun/Missile System

Mission

The Pantsyr-S1 air defence gun/missile system is intended to provide air defence to small-size administrative, industrial and military installations, including mobile ones, against modern air strike weapons, including precision-guided munitions, as well as to reinforce defence groupings in countering air raids.

The Pantsyr-S1 short-range mobile all-weather air defence gun/missile system is capable of engaging targets by a combined fire of artillery and missile weapons. The system is highly autonomous as regards combat operation in automatic cycle. The combat vehicle is mounted on tracked chassis and has a jam-resistant integrated radar/optical weapons control system. The CV can fire missiles and guns when on the move.

Composition

- combat assets
- maintenance assets
- training assets

A typical set of combat assets includes:

- up to six tracked/wheeled/containerised CVs in a battery;
- battery command post;
- up to 8/12 CV-mounted 57E6-E SAMs in TLC (their number depends on design/configuration features);
- up to 1,400 30-mm rounds per one CV;
- transporter/loader vehicle.

The maintenance assets include:

- CV repair, maintenance and adjustment means;
- basic set of missile test and monitoring equipment;
- storage and transportation means for a group set of spare parts, tools and accessories.

The training assets include mobile and classroom-based simulators.

Each CV has a satellite navigation system, air conditioning system, electric power supply system, voice and data communications, meteorological, and combat operation recording equipment.

Basic specifications	
Target detection and designation radar:	
max detection range (RCS = 2 sq.m), km	32 – 36
number of simultaneously tracked targets	20
Target and missile tracking radar:	
max tracking range (RCS = 2 sq.m), km	24 – 28
number of simultaneously tracked targets/missiles	1 / 2
Electro-optical system:	
max autotracking range, km	17 – 26
number of simultaneously tracked targets/missiles	1 / 1
Missile/gun engagement envelope, km:	
range	1.2 – 20 / 0.2 - 4
altitude	0.005 – 10 / 0 - 3
Max target speed, m/s	1,000
Reaction time, sec	4 - 6
Missile weight, kg	74.5
Warhead weight, kg	20
Artillery weapons	two anti-aircraft automatic cannons
Total rate of fire, rds/min	4,500 –5,000
Crew	3

ZSU-23-4 SHILKA

Self-Propelled Anti-Aircraft Gun System Modernisation

Mission

The ZSU-23-4 Shilka self-propelled anti-aircraft gun system is designed to provide air defence of land forces in all kinds of combat operations, as well as that of installations. The ZSU-23-4 SPAAG system can detect and engage fixed- and rotary-wing aircraft (including hovering helicopters) and other low-altitude air targets from stationary position, short halts or on the move, as well as ground/surface targets.

Profound modernisation of the vintage ZSU-23-4 Shilka systems is proposed as ZSU-23-4M4. Hit probability (with up to 300 rounds allowance) of the upgraded Shilka against one air target passing through its engagement envelope is increased by 0.6 approaching that of a close-range ADMS.

Basic specifications

	Before modernisation	After modernisation
Integration into a single AD system	n/a	available
Aerial targets detection range, km	12	34 (with external target designation)
Fire control system	radar	radar (ZSU-23-4M4)
Tracking and engagement of manoeuvring targets	restricted	available
Aerial targets hit probability with radar guidance	0.07 – 0.12	0.3 – 0.6
On-line testing of the system's operability	n/a	available
Integrated training equipment	n/a	available

ZSU-23-4 Shilka SPAAG system modernisation envisages:

- replacement of the existing with advanced radar system featuring improved performance;
- replacement of the analogue with up-to-date digital computer;
- introduction of equipment to receive external target designation data, ensuring automated combat control of the AA gun from a command post of the unit;
- introduction of built-in test equipment, as well as a multi-functional simulator to provide training at operators' workstations;
- introduction of self-defence system elements: to protect the SPAAG system against high-precision weapons, to reduce its IR signature, as well as fitting it with an air conditioning system.

Modernisation of the SPAAG systems by introducing up-to-date microcircuitry and components providing digital data processing and exchange will ensure SPAAG system's repairs and supply of spare parts, tools and accessories for another 10 – 12 years.

The Shilka modernisation programme is aimed at improving control, operational and life support capabilities. It includes upgrading of tracked chassis and primary power supply system. An economical diesel-electric power unit improves combat control and crew's working conditions.

At customer request, the SPAAG system can mount a set of control equipment with two Strelets-23 launch modules, designed to carry and launch four Igla-type missiles, as well as an IFF transponder complying with customer's existing standards.

ZU-23

Anti-Aircraft Gun Mount Upgrade

Mission

The upgraded ZU-23 anti-aircraft gun mount is designed to effectively engage air attack weapons, including low-flying manoeuvring air targets of opportunity (tactical aircraft, attack helicopters, cruise missiles and remotely piloted vehicles), by day and night, in restricted visibility conditions.

The ZU-23 is upgraded into the ZU-23M and the ZU-23M1 variants.

Composition

The modernised AD systems comprise new elements, such as:

- launch module with two Igla SAMs and a set of control equipment (ZU-23M1 only);
- electro-optical target search-and-track system, consisting of an electro-optical module (TV-camera, thermal imager, laser range-finder and control unit) with automatic tracker;
- digital computer;
- targeting servos;
- rotating contact device;
- control and display panel;
- target designation data receiving equipment;
- radio and wire communications means;
- primary electric power supply system.

With the crew reduced by one man, the upgraded AD systems boast the following features: full guidance automation and precision target tracking, as well as automatic computations and processing of lead angles and gun/SAM engagement envelopes (ZU-23M1), which have considerably increased AD systems' fire efficiency. The ZU-23M1 provides target engagement by combined fire of the missile/gun weapons.

Basic specifications

	ZU-23M	ZU-23M1
Target engagement envelope, km:		
range	0.2 - 2.5	0.2 – 5.2
altitude	up to 1.5	up to 3.5
Guidance mode	automatic + semiautomatic	
Target tracking error, min	not more than 5	
Lead angle computation and processing error, min	not more than 3	
Target speed, m/s	0 - 300	0 - 400
Target hit probability:		
by missile	same as for Igla MANPADS	
by a twin-barrel gun mount	up to 0.3	
Night and poor visibility capacity	available	